WHAT IS CLAIMED IS:

1. A method of generating a plurality of non-orthogonal halftone screens for substantially moiré-free four-color halftoning, comprising:

locating non-orthogonal halftone cells suitable for tiling an image plane that are substantially specified by two frequency vectors $\mathbf{F}_{n_1} = (fx_{n_1}, fy_{n_1})$ and $\mathbf{F}_{n_2} = (fx_{n_2}, fy_{n_2})$, where n = color indices a, b, c, d of four different colors;

identifying combinations of four of the non-orthogonal halftone cells which simultaneously satisfy:

$$\mathbf{F}_{a_1} + \mathbf{F}_{b_1} + \mathbf{F}_{c_1} = 0, \text{ and}$$

$$\mathbf{F}_{a_2} + \mathbf{F}_{b_2} + \mathbf{F}_{c_2} = 0$$

and

$$\mathbf{F}_{a_1} + \mathbf{F}_{b_2} + \mathbf{F}_{d_1} = 0, \text{ and}$$

$$\mathbf{F}_{a_2} + \mathbf{F}_{b_1} + \mathbf{F}_{d_2} = 0$$

where,

$\mathbf{F}_{d_1} \neq \mathbf{F}_{c_1}$, $\mathbf{F}_{d_1} \neq \mathbf{F}_{c_2}$, $\mathbf{F}_{d_2} \neq \mathbf{F}_{c_1}$, and $\mathbf{F}_{d_2} \neq \mathbf{F}_{c_2}$, and

$$|\mathbf{F}_{n_x} \pm \mathbf{F}_{m_y}| > \mathbf{M}$$

where,

$\mathbf{M}$ = minimum acceptable two-color moiré frequency

n = a, b, c, d

m = a, b, c, d

$n \neq m$

x = 1, 2,

y = 1, 2;

selecting one of the identified combinations of four non-orthogonal halftone cells; and

associating each non-orthogonal halftone cell of the selected identified combination with one or more color separations of a color halftone printer.

2. The method defined in claim 1 further comprising:

identifying combinations of any three of the located non-orthogonal halftone cells prior to the step of identifying combinations of four of the non-orthogonal halftone cells, where the frequency vectors of the identified combinations satisfy:

$$\mathbf{F}_{n_1} + \mathbf{F}_{m_1} + \mathbf{F}_{p_1} = 0 \quad \text{, and}$$

$$\mathbf{F}_{n_2} + \mathbf{F}_{m_2} + \mathbf{F}_{p_2} = 0$$

where,

n = a, b, c, d

m = a, b, c, d

p = a, b, c, d

a, b, c, d are color indices of four different colors

$n \neq m \neq p$, and

$$|\ \mathbf{F}_{n_x} \pm \mathbf{F}_{m_y}\ | > \mathbf{M}$$

where,

M = minimum acceptable two-color moiré frequency

x = 1, 2

y = 1, 2.

3. The method defined in claim 1 wherein the two frequency vectors specifying each non-orthogonal halftone cell satisfy:

$$|\ \mathbf{F}_{n_1} \pm \mathbf{F}_{n_2}\ | > |\ \mathbf{F}_{n1}\ | \text{ and}$$

$$|\ \mathbf{F}_{n_1} \pm \mathbf{F}_{n_2}\ | > |\ \mathbf{F}_{n_2}\ | \ .$$

4. The method defined in claim 1, wherein non-orthogonal includes cell shapes containing right angles.

5. The method defined in claim 1, further comprising:

applying constraints to the located non-orthogonal halftone cells; and

removing non-orthogonal halftone cells that do not satisfy the constraints from the located non-orthogonal halftone cells.

6. The method defined in claim 5, further comprising:

applying constraints to the identified combinations of non-orthogonal halftone cells; and

removing combinations of non-orthogonal halftone cells that do not satisfy the constraints from the identified combinations of non-orthogonal halftone cells.

7. The method defined in claim 1, further comprising:

applying constraints to the identified combinations of non-orthogonal halftone cells; and

removing combinations of non-orthogonal halftone cells that do not satisfy the constraints from the identified combinations of non-orthogonal halftone cells.

8. An apparatus for generating non-orthogonal halftone screens for substantially moiré-free four-color halftoning, comprising:

a non-orthogonal halftone cell locating circuit, routine or agent that locates substantially non-orthogonal halftone cells suitable for tiling an image plane that are substantially specified by two frequency vectors $\mathbf{F}_{n_1} = (fx_{n_1},$

fy_{n_1}) and $\mathbf{F}_{n_2} = (fx_{n_2}, fy_{n_2})$, where n = color indices a, b, c, d of four different colors;

a first non-orthogonal halftone cell combination identifying circuit, routine or agent that identifies combinations of four of the located non-orthogonal halftone cells which simultaneously satisfy:

$$\mathbf{F}_{a_1} + \mathbf{F}_{b_1} + \mathbf{F}_{c_1} = 0 \quad \text{, and}$$

$$\mathbf{F}_{a_2} + \mathbf{F}_{b_2} + \mathbf{F}_{c_2} = 0$$

and

$$\mathbf{F}_{a_1} + \mathbf{F}_{b_2} + \mathbf{F}_{d_1} = 0 \quad \text{, and}$$

$$\mathbf{F}_{a_2} + \mathbf{F}_{b_1} + \mathbf{F}_{d_2} = 0$$

where,

$\mathbf{F}_{d_1} \neq \mathbf{F}_{c_1}$, $\mathbf{F}_{d_1} \neq \mathbf{F}_{c_2}$, $\mathbf{F}_{d_2} \neq \mathbf{F}_{c_1}$, and $\mathbf{F}_{d_2} \neq \mathbf{F}_{c_2}$, and

$$| \mathbf{F}_{n_x} \pm \mathbf{F}_{m_y} | > \mathbf{M}$$

where,

$\mathbf{M}$ = minimum acceptable two-color moiré frequency

n = a, b, c, d

m = a, b, c, d

$n \neq m$

x = 1, 2

y = 1, 2; and

a non-orthogonal halftone cell selector circuit, routine or agent that selects one of the identified combinations of four halftone cells and associates each of the selected cells with a color separation of a color halftone printer.

9. The apparatus defined in claim 8 further comprising:

a second non-orthogonal halftone cell combination identifying circuit, routine or agent that identifies combinations of three of the located non-orthogonal halftone cells and provides them to said first non-orthogonal halftone cell combination identifying circuit, routine or agent, wherein the frequency vectors of the identified combinations of three non-orthogonal halftone cells satisfy:

$$\mathbf{F}_{n_1} + \mathbf{F}_{m_1} + \mathbf{F}_{p_1} = 0 \quad , \text{ and}$$

$$\mathbf{F}_{n_2} + \mathbf{F}_{m_2} + \mathbf{F}_{p_2} = 0$$

where,

n = a, b, c, d

m = a, b, c, d

p = a, b, c, d

a, b, c, d are color indices of four different colors

$n \neq m \neq p$, and

$$| \mathbf{F}_{n_x} \pm \mathbf{F}_{m_y} | > \mathbf{M}$$

where,

M = minimum acceptable two-color moiré frequency

x = 1, 2

y = 1, 2.

10. The apparatus defined in claim 8 wherein the two frequency vectors specifying each non-orthogonal halftone cell satisfy:

$$| \mathbf{F}_{n_1} \pm \mathbf{F}_{n_2} | > | \mathbf{F}_{n_1} | \text{ and}$$

$$| \mathbf{F}_{n_1} \pm \mathbf{F}_{n_1} | > | \mathbf{F}_{n_2} | .$$

11. The apparatus defined in claim 8, wherein non-

orthogonal includes cell shapes containing right angles.

12. The apparatus defined in claim 8, further comprising:

a located non-orthogonal halftone cell removing circuit, routing or agent that removes located non-orthogonal cells according to a set of locating constraints.

13. The apparatus defined in claim 12, further comprising:

a non-orthogonal halftone cell combination removing circuit, routine or agent that removes non-orthogonal halftone cell combinations according to a set of combination removing constraints.

14. The apparatus defined in claim 8, further comprising:

a non-orthogonal halftone cell combination removing circuit, routine or agent that removes non-orthogonal halftone cell combinations according to a set of combination removing constraints.

15. A method for using a plurality of non-orthogonal halftone screens for substantially moiré-free color halftoning, comprising:

inputting an image data;

converting the image data to a halftone image data;

locating a plurality of tileable halftone screens that contain combinations of non-orthogonal halftone cells where each non-orthogonal halftone cell is substantially specified by two frequency vectors $\mathbf{F}_{n_1} = (fx_{n_1}, fy_{n_1})$ and $\mathbf{F}_{n_2} = (fx_{n_2}, fy_{n_2})$, where n = color indices a, b, c, d of four different colors;

identifying combinations of four of the non-orthogonal halftone cells which simultaneously satisfy:

$$\mathbf{F}_{a_1} + \mathbf{F}_{b_1} + \mathbf{F}_{c_1} = 0$$, and
$$\mathbf{F}_{a_2} + \mathbf{F}_{b_2} + \mathbf{F}_{c_2} = 0$$

and

$$\mathbf{F}_{a_1} + \mathbf{F}_{b_2} + \mathbf{F}_{d_1} = 0$$, and
$$\mathbf{F}_{a_2} + \mathbf{F}_{b_1} + \mathbf{F}_{d_2} = 0$$

where,

$\mathbf{F}_{d_1} \neq \mathbf{F}_{c_1}$, $\mathbf{F}_{d_1} \neq \mathbf{F}_{c_2}$, $\mathbf{F}_{d_2} \neq \mathbf{F}_{c_1}$, and $\mathbf{F}_{d_2} \neq \mathbf{F}_{c_2}$, and

$$| \mathbf{F}_{n_x} \pm \mathbf{F}_{m_y} | > \mathbf{M}$$

where,

$\mathbf{M}$ = minimum acceptable two-color moiré frequency

n = a, b, c, d

m = a, b, c, d

$n \neq m$

x = 1, 2

y = 1, 2; and

forming an image on an image recording medium using the halftone image data.

16. The method defined in claim 15, wherein non-orthogonal includes cell shapes containing right angles.

17. The method defined in claim 15, further comprising:

applying constraints to the located non-orthogonal halftone cells; and

removing non-orthogonal halftone cells that do not satisfy the constraints from the located non-orthogonal

halftone cells.

18. The method defined in claim 17 further comprising:

applying constraints to the identified combinations of non-orthogonal halftone cells; and

removing combinations of non-orthogonal halftone cells that do not satisfy the constraints from the identified combinations of non-orthogonal halftone cells.